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SELF-CALIBRATION FOR A CATADIOPTIC CAMERA

ABSTRACT OF THE DISCLOSURE

10 A method and a system for self-calibrating a wide field-of-view camera (such
as a catadioptric camera) using a sequence of omni-directional images of a scene
obtained from the camera. The present invention uses the consistency of pairwise
features tracked across at least a portion of the image collection and uses these
tracked features to determine unknown calibration parameters based on the
15 characteristics of catadioptric imaging. More specifically, the self-calibration method
of the present invention generates a sequence of omni-directional images
representing a scene and tracks features across the image sequence. An objective
function is defined in terms of the tracked features and an error metric (an image-
based error metric in a preferred embodiment). The catadioptric imaging
20 characteristics are defined by calibration parameters, and determination of optimal
calibration parameters is accomplished by minimizing the objective function using an
optimizing technique. Moreover, the present invention also includes a technique for
reformulating a projection equation such that the projection equation is equivalent to
that of a rectilinear perspective camera. This technique allows analyses (such as
25 structure from motion) to be applied (subsequent to calibration of the catadioptric
camera) in the same direct manner as for rectilinear image sequences.

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